

HORIZONTAL CLOUDS OR VERTICAL CLOUDS?

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ABSTRACT

Advances in climate models, cloud parameterizations, and physical understanding call for accurately representing the variability of cloud properties in both horizontal and vertical dimensions. This work compares the similarities, and contrasts the differences between the horizontal and vertical variations of cloud properties, with the focus on the mutual relationships among key cloud microphysical parameters (e.g., cloud liquid water content, droplet concentration and relative dispersion of the cloud droplet size distribution). In-situ aircraft measurements from the MASE and other programs are analyzed. It is shown that the relationships between some of the microphysical properties are just the opposite in the two dimensions, posing the important question of whether horizontal or vertical variability is referred to when relationship between cloud microphysical parameters is the subject of interest. Physical processes (e.g., aerosol, updraft and turbulence) underlying such characteristic differences in these relationships are explored.